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PAPERS READ AT THE ANNUAL MEETING

—OF—

The American Society of Microscopists,

HELD AT BUFFALO, NEW YORK,

AUGUST 19-23, 1878.

ON CERTAIN CRUSTACEA PARASITIC ON FISHES FROM THE GREAT LAKES.

BY D. S. KELLICOTT.

In this paper I propose to give an account of two species of parasitic crustacea from fish taken in Lake Erie, also of one from a tributary of Lake Huron. The first two are from the Lake Herring, *Coregonus artedi*, the third from the Rock Bass, *Ambloplites rupestris*. Of those belonging to the herring, one attaches itself to the gills, the other fastens to the outer surface of the body, or to the fins; the one from the rock bass adheres to the inner margin of the branchial arches, or sometimes to the prominent teeth of the same. These forms, together with *Lerneocera cruciata*, make two species of these communistic leeches enjoying a home on each of these two well-known fishes.

The species referred to in this paper belong to the family *Lernaeopodadae*, characterized by their manner of permanently fastening themselves to their host by means of a button or disc at the extremity of the united members of the last thoracic pair of limbs, and are thus separated, on the one hand, from the *Chondracanthadae*, which hold on by means of their foot-jaws, which mode allows a change of place, and, on the other hand, from the *Lernaeoceridae*, which bury their head and upper thorax into the soft parts of the host.

I content myself at this time with the presentation of descriptions and drawings of these forms, together with such facts in their history as I may know; for I am not able to satisfy myself as to their identity until I secure material for which I am corresponding, and which when secured, will, I expect, enable me to do so. Before proceeding with the sketches, allow me to express the hope that I may succeed to some degree in calling the attention of some of those who know how to use the microscope to these creatures. The realization of such hope would certainly be reason enough and reward enough for preparing and presenting this paper.

THE GILL HERRING-SUCKER.

This form is explained by Fig. 1 to 3. It is found not uncommonly among the gills and on the sides of the gill cavity *Coregonus artedi*, taken in Buffalo harbor and vicinity during autumn and winter. It is rather a bulky species, inhabiting rather narrow quarters, but its parts are disposed accordingly. It is entirely without color except that in the sucker (Fig. 1, *d*), the fibre connecting it with the arms and the two rudimentary organs beneath the extremities of the body are brown, and apparently chitinous.

The outline of the body, seen from above, is broadly ovate, nearly as broad as long; seen from the side it is hemispherical, the tip being drawn well under. It thus reminds one of the abdomen of certain female spiders. The length of the head exceeds but little its breadth. The arms reach well above the head and end in a strong corrugated fibre which attaches the suctorial disc. The disc is convex above, concave below, slightly ovate-emarginate, with basal margin produced and rounded. Above the arms stands a strong prehensile pair of limbs, the second foot-jaws; they are three-jointed, reaching nearly to apex of head, the terminal piece obtusely rounded with one minute hook, carried at right angles to the second (Fig. 1, *j*).

Looking down upon the apex of the head of a specimen treated with caustic potassa a pair of appendages were defined which I take to be the first pair of antennæ; their appearances and positions are designated in Fig. 2. The second pair of antennæ I have not been able to well define; they seem to be two fleshy organs, lying parallel with the beak, terminating in a small joint with two unequal teeth. I have been unable to make out any other appendages.

The ovigerous sacks (Fig. 1, *o*) diminish in size toward the apex, seen from the side they are shaped like a hay knife; they are disposed over the body, but slightly exceeding it in length. There are as many as eight rows of eggs at the widest parts, not more than four towards the apex. I estimate the number in each sack at one hundred; their diameter is .33 mm.; at a certain stage of development each egg shows four brown points arranged in a quadrangle; a few days before the young leave the ova these spots are seen as irregular patches.

The full size of parts I measure as follows, an average sized individual being used:

Length of body and head	7	mm.
Greatest breadth of body	3.25	"
Breadth of sucker	3	"
Length of ovisacs	4.25	"

The male I have not seen.

THE YOUNG.—I am able to present the following notes concerning the preliminary stages. I have not thus far obtained females recently transformed, i. e. without egg-tubes fully developed and filled; those taken in November, however, rarely, if ever, have embryos far advanced; during December and January I have often taken them with embryos well along and moving in their shells; December 10th such a tube of embryos was secured, it was placed in a glass of water, on my table, and watched; on the 13th several escaped, one of which served for my drawing (Fig. 3). As the examples of the young of the *Lerneopodans*, given by authors at hand, as I write, are in the nauplius stage on leaving the egg, and as my observations were interrupted by considerable intervals I was not sure that it had not materially changed before it was sketched, so I removed several of the same brood from the egg and found them in the form of the swimming ones, hence it is pretty certain that the young of this species appears in a far advanced zoea-like state. As the embryo is dragged from its covering it is shown to lie with the dorsal surface against the wall, the ventral surface of its abdomen folded against that of the thorax, so that the limbs seen through the coverings several day previous to hatching are those pertaining to the mouth.

For details of appendages seen from above I refer to the figure. The entire length of thorax and abdomen measures .92 mm. The organs, not shown in the figure, seen on the ventral surface of one taken from the egg, are as follows: situated some distance back of the mouth are two pair of prehensile limbs; the first pair are robust, terminating in a long claw; the second pair are more slender, ending also in a hook, but less powerful. Situated posteriorly to, and at the outer angles of, what are evidently the mouth parts are two antennal organs directed backwards terminating in several setae, they stand in front of and within the pair of foot-jaws, marked *j*, in the figure. Concerning the mouth I can define with some satisfaction three parts: in front a transverse fleshy ridge or lip, back of which are two curved blade-like organs with rounded ends. The parts as seen under good illumination, with careful focussing and a good deal of gazing, are pretty clearly a prophecy of the mouth of the adult.

THE EXTERNAL HERRING-SUCKER.

This second form, illustrated by figures 4 and 5, inhabits the same species as the one just described. I have found it not uncommon during the greater part of the year on the lake herring taken by the fishermen along the Niagara River. It fastens to the surface, preferring the fins, although I have taken them from various parts of the body. They are quite tenacious of life as they may live ten or twelve hours after being removed.

The dimensions of the parts of an average specimen were taken as follows:

Entire length from sucker to extremity of egg-tubes	17	mm.
Length of tubes	6	"
Length of body and head	8	"
Length of arms	5.75	"
Greatest width of body	2.5	"

The outline of the body is obovate, broadest at the beginning of the last third. Under the extremity of the body of an individual treated with caustic potassa may be seen two powder-horn shaped chitinous bodies. Originating near their extremity are the fibres which hold the egg sacks, i. e. suspended from the lower border of the first or lateral abdominal lobe; they are cylindrical, relatively long, straight, or slightly curved toward each other at the middle; in some cases I have found them to terminate in an apparent, straight, sharp spine, a fifth or more as long as they.

The alimentary canal of this species can be pretty clearly defined while the animal is still alive. To the straight plain oesophagus succeeds a strongly wrinkled part, extending to the last third of the body, where it enlarges, and again becomes smooth, then rapidly contracts to the anus. It is filled as in other species with brown granulated matter which moves backward and forward with the pulsations. At *p*, Fig. 5, are fibres on either side which alternately draw the tube right and left as in the following species (Fig. 6, *r*).

The arms are long and slender, terminating with an ovoid button which adheres to the fish; the fibre connecting it to the arm is so short that it appears sessile (Fig. 5, *b*). The second pair of jawfeet are robust, the terminal joint is carried at right angles to the second; its articulation with that joint is, however, very free; it terminates with one hook (Fig. 5, *i*). The remaining appendages which I have been able to define are shown in Fig. 4, which is, in part, a camera drawing of the underside of the apex of the head. I interpret the figure as follows: The second antenna at *j*; they consist of a robust basal part surmounted by two other pieces. One bears a short joint ending in a hook turned outwards, the other bears a disc, facing downwards, bearing numerous hairs also turned outwards. At *a*, is an antenna of the first pair. I have seen a pair of minute articulated bodies at *x*, which, perhaps, represent maxillæ. The young of this species I have not seen.

The male is minute, found attached to the extremity of the female's abdomen, and so firmly that he can not be removed without mutilation, so I am unable to present a drawing or anything like a complete account, this I hope to be able to do; after treatment of a specimen with caustic potassa, he is seen as a lobular brownish body, whose importance is not at first glimpse apprehended.

THE ROCK BASS-SUCKER.

This third form is explained by Figs. 6 and 7. It inhabits the inner surface of the gill arches of *Ambloplites rupestris*. It being a small species, and so mingled with the teeth on the surfaces it infests that I suspect it was overlooked many times, for after being acquainted with it I found one or more on fully one-half the examples of the fish examined. My acquaintance with it began in July of this year (1879).

Entire length from extremity of arms to end of ovigerous sacks a little more than 5 mm.; length of body and head a little above 2.5 mm.

The outline of the body is broadly ovate, the upper part of the thorax terminating in the head similar in shape. The alimentary canal may be traced its entire length in living specimens, it shows brown granular matter within, especially in the upper part. A contraction and dilation passes rhythmically from end to end. At each pulse the canal is drawn first to one side and at the beginning of the next to the other side by fibrous bands shown at Fig. 6, *r*; these fibres arise from prominent protrubrances. If these fibres are themselves the muscles that move the intestinal tube they are nonstriated, for I could bring the quarter inch objective to bear upon them without seeing the striae, while the inch clearly resolves striated muscles in the limbs and thorax. On either side of the lower body is an illy definable body (Fig. 6, *o*) which I take to be an oviduct. On either side of the canal are numerous bodies which are doubtless eggs. I have counted sixty on one side which certainly is more than enough to fill the egg sac once. These sacs are cylindrical obtusely rounded at both ends, the length exceeding a little more than twice the width.

The arms are robust, long, ending in a button of the usual form; fibre longer than in the external herring parasite. For the details of the underside of the head

Plate 1

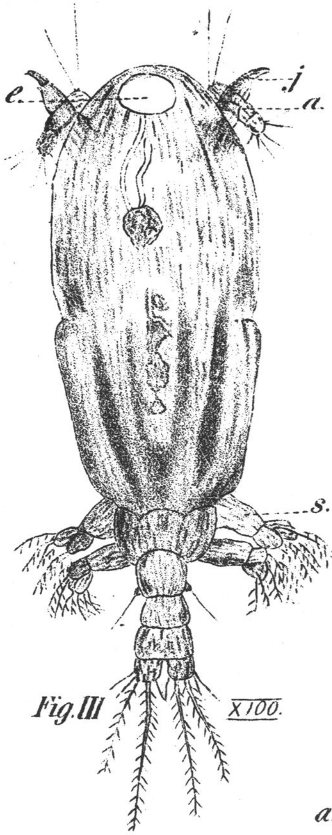

Fig. III X100.

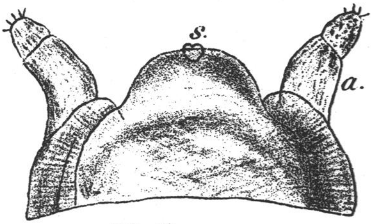

Fig. II. X100.

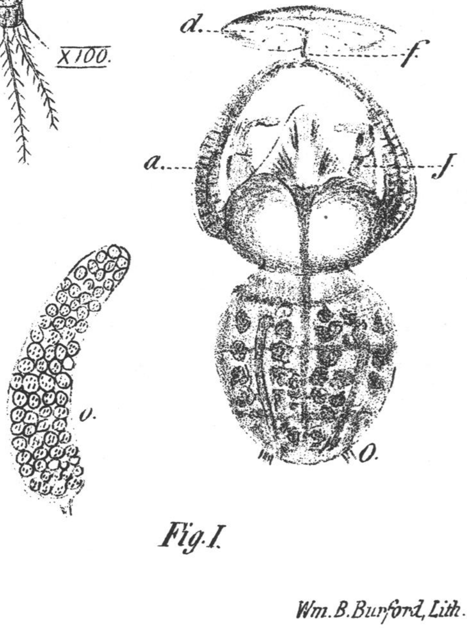

Fig. I.

Wm. B. Burford, Lith. Ind^{s}

Plate 2.

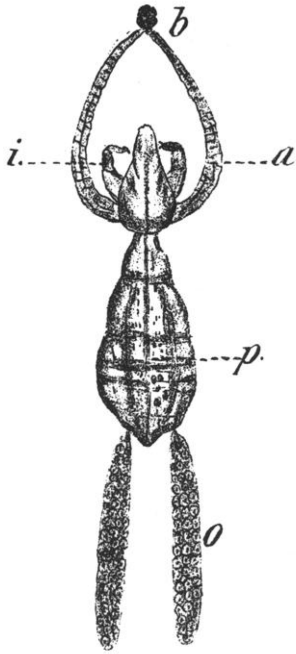

Fig.V. X 5.

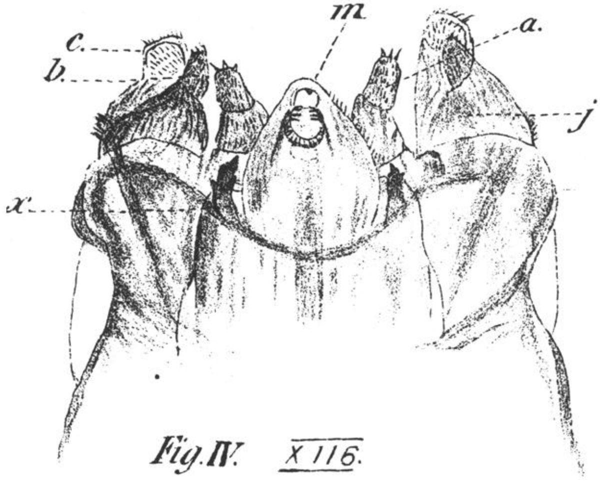

Fig.IV. X 116.

Wm. B. Burford, Lith. Ind^{s}

Plate 3.

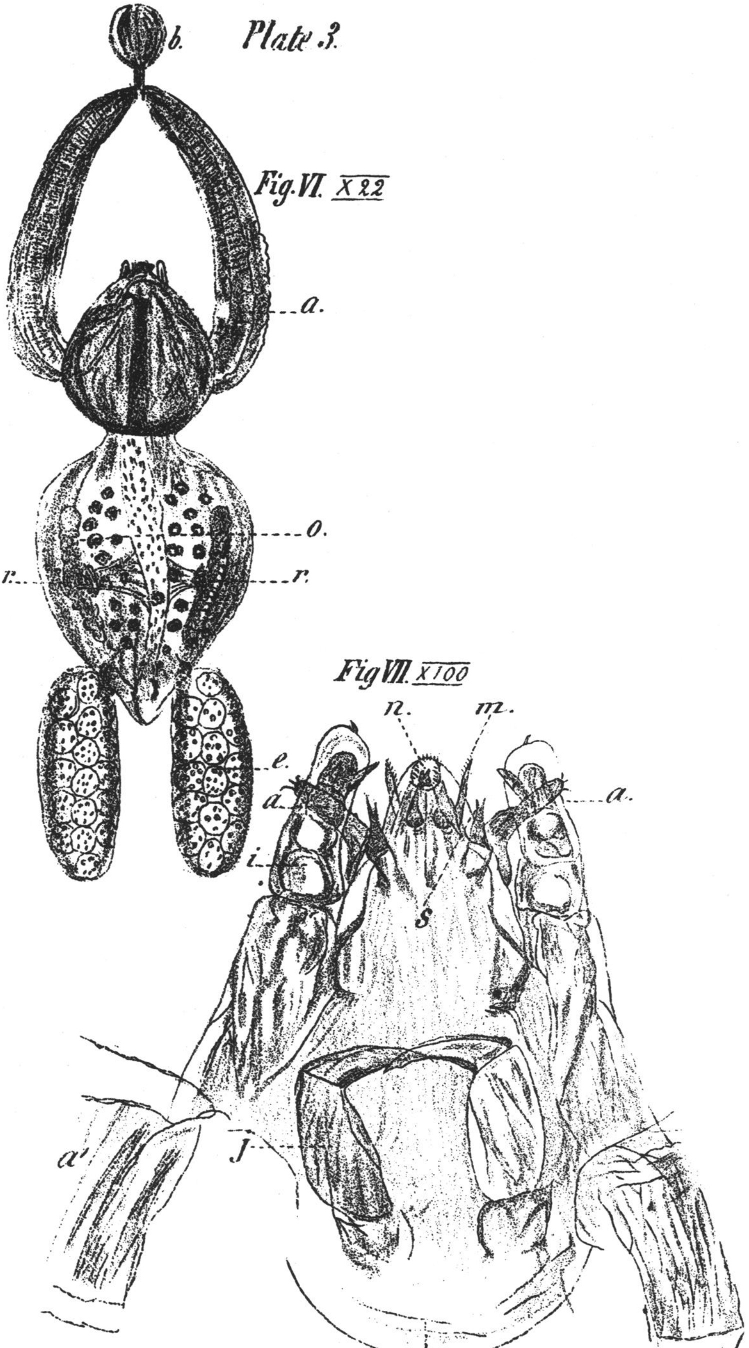

Fig. VI. ×22

Fig VII. ×100

Wm. B. Burford, lith. Ind^s

see Fig. 7, which was drawn by the aid of the camera, and shows all that was defined in their proper relations. I should designate the parts figured as follows: *a*, beginning of the arm; *j*, the first pair of footjaws; *i*, second pair of antennæ; *a*, antennæ; *i*, styliform appendage, or second antennæ; *n*, oral opening; *m*, mandibles; *s*, maxillæ.

The male of this species I have seen, but owing to misfortune was unable to sketch it, so I omit further reference to it, except to say that the one seen was detached, and although I have taken microscope and compressor with me "a fishing" and examined numerous females at once as taken, I was not successful in securing another; either his minuteness has been overlooked as attached, or he is free at will, fleeing danger that his partner must face.

ON THE GROWTH OF THE FIRST BRANCHIAL CLEFT.

BY LUCIEN HOWE, M. D.

Nearly every detail concerning the Eustachian tube has been so carefully studied by Rudinger, Urbantschitsch and others, that there would seem to be little opportunity for new observations concerning it. There is, however, one question which apparently remains unsettled, for when the student would learn as to the development and growth of this portion he finds the literature of the subject only fragmentary, and the statements concerning it often contradictory. The great impetus, however, which has been given to the study of embryology by Kölliker, Haeckel, and their collaborator, has caused the development of separate organs to be examined more in detail, and among the others the ear has not been neglected.

In order to make the description as clear as possible, it is advisable to recall for a moment a few familiar facts of development and mention the views of the older authorities concerning them. It will be remembered that at an early stage of fœtal life there are formed near the lower part of the cephalic mass several horizontal slits, called the branchial fissures or gill openings. These range in number from three to six, being the most numerous in the lower vertebrates. The buds or processes included between them are known as the gill arches. As the embryo grows, the superior pairs of these arches increase in size, and uniting in the median line assist in forming the lower jaw. Meanwhile, also, the first or superior gill opening is encroached upon by the new tissue, gradually becoming smaller and smaller. The question as to whether or not this fissure becomes entirely closed will form the main feature of the present remarks. Several authorities incline to the opinion that the persistence of a portion of this fissure constitutes the Eustachian tube, while other observations make it appear that the opening becomes entirely obliterated, and the tube is formed subsequently by a diverticulum from the pharynx which extends outwards until it reaches the external ear. For it is now generally conceded that the external ear is formed from an involution of the tegumentary covering which becomes apparent at a very early stage of fœtal life.